

Shorter fixation durations in visual search after 24 hours of total sleep deprivation

Christian Mühl and Daniel Aeschbach

Institute of Aerospace Medicine, German Aerospace Center (DLR), Germany

Topics: Attention, Executive control

Keywords: sleep deprivation, attention, visual search, search performance, fixation duration, saccade velocity

Visual attention is a relevant construct in the domain of aviation, since information for operators is often presented visually. Shift and night work schedules in the aviation industry require an understanding of the susceptibility of visual attention to sleep deprivation (SD). To study the effect of SD on visual attention, we employed two well-established serial search paradigms and analyzed average fixation duration and saccade velocity. We expected SD-induced cognitive slowing to be accompanied by longer fixation durations and slower saccades.

We measured search performance and the related oculomotor characteristics before and after 24 hours of SD in 24 subjects, as well as in a well-rested control group. Search performance deteriorated significantly compared to the control group in terms of speed and accuracy. Saccade velocity decreased strongly. Contrary to our expectation, we found a decrease in fixation duration under SD, while the number of fixations did not change significantly.

The results show only a partial slowing of oculomotor characteristics in visual search after SD. The decrease of mean fixation duration, however, might indicate a propensity for faster and riskier decision-making, manifesting itself on the level of single fixations. Known as “speed-error trade-off”, such behavior reflects problems to compensate SD-impaired cognitive processes.